DOCUMENT RESUME

ED 078 678 EM 011 225

AUTHOR Riskin, John

TITLE Written Composition and the Computer.
INSTITUTION Illinois Univ., Urbana. Computer-Based Education Lab.
SPONS AGENCY National Science Foundation, Washington, D.C.
REPORT NO CERL-R-X-31
PUB DATE Sep 71
NOTE 29p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Composition (Literary); *Composition Skills (Literary); *Computer Assisted Instruction; Concept Formation; Phonetic Analysis; Program Descriptions; Programed Instruction; Spelling; Writing; *Writing Exercises; *Writing Skills
IDENTIFIERS Conceptual Comparator; Phonetic Spelling Judger

ABSTRACT

Programed instruction is little employed as a medium for teaching people to write effectively. Since composition involves the production of original sentences and current computer facilities are not yet sufficiently powerful to deal with this phenomenon, it is not feasible to have a complete computer-assisted instruction (CAI) writing course. Nevertheless, it is possible to give instruction in many of the basic skills and concepts which precede the final act of writing. To accomplish this, the CAI system must possess two semantic capabilities--those of conceptual comparison and phonetic spelling judgment. Given these, it is possible to construct a hierarchy of composition concepts, of which the following list is an example: audience, purpose, strategy, thesis, research, organization, introduction, transition, conclusion, paragraphs, and sentences. Assuming that the student possesses an entering repertory of skills relevant to each concept, it is possible to develop CAI activities or lessons which will develop those particular skills and thus contribute to his overall ability to write. (Author/PB)

ED 078678

CERL REPORT X-31 SEPTEMBER, 1971

WRITTEN COMPOSITION AND THE COMPUTER

JOHN RISKIN

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

Computer-based Education Research Laboratory

University of Illinois Urbana Illinois

FILMED FROM BEST AVAILABLE COPY

EM 011 225

ED 078678

The PLATO system is supported by the National Science Foundation under grant GJ 29981.

Reproduction in whole or in part is permitted for any purpose of the United States Government.

Distribution of this report is unlimited.

ABSTRACT

The semantic capabilities necessary for flexible computer-based instruction in written composition are discussed, and it is decided that a conceptual comparator and a phonetic spelling judger are desirable if not essential. A tentative sequential hierarchy of composition concepts is then presented, and various suggestions for computer-based lessons in those concepts are given.

Programmed instruction has been little employed as a medium for teaching people how to write effectively. The few programmed textbooks and CAI programs that exist in the field focus almost entirely on easily programmed aspects of the language such as spelling, vocabulary, usage, or formal grammar (2, 7). The reason for this is that composition involves the production of original sentences and today's programmed instruction media are incapable of even beginning to judge the extent to which a freely generated string of words constitutes a correct response to some question or instruction. Even in computer-aided or computer-based instruction facilities, the most that can presently be done is to examine a student's answer and check for the presence or absence of particular words or their synonyms. And while fairly efficient syntactic parsers are available (5, 6, 11), and efficient semantic parsers are being developed (8, 10), there will still be a delay of at least a few years before computers can talk economically and with any freedom with humans.

A completely computer-based course in effective writing, then, is not currently feasible. But it <u>is</u> currently feasible to give instruction in many of the basic skills and concepts that necessarily precede the final act of writing. To teach those concepts effectively probably requires more interaction between student and teaching-medium than a conventional programmed textbook can give, and the only medium other than a live teacher is a computer-based instruction system.

Before going further I want to stress that I don't feel that a computer can teach people, by itself, to write effectively. I suspect that there is a tremendous gap between knowing what the principles of effective writing are and using those principles effectively. At best, the computer can provide useful instruction in some of the underlying principles.

In the remainder of this article I intend to do three things. First, I will outline the sort of linguistic capability that I feel a computer-based instruction system must have to teach some of the underlying principles of effective writing. Second, I will present a tentative order in which such principles should, perhaps, be taught. Third, in presenting each principle I will suggest at least one sort of activity that a computer-based instruction system could handle and that could lead to the student's mastery of the specified principle.

MINIMAL LINGUISTIC COMPETENCY FOR A COMPUTER

It goes almost without saying that a CAI system must be able to recognize any of a set of expected answers for a given question. Where the answer is a single word, it should recognize that word; where the answer is a word-group it should optionally be able to recognize an exact pattern of words or a set of keywords and forbidden words in a larger phrase. Of course, it should also be able to branch to various alternative instructional frames depending on which one of a series of possible answers is given.

But for teaching the underlying principles of composition a CAI system must do even more than the above.

No student should be excluded from lessons in effective writing simply because he is a poor speller. Not only does spelling involve an entirely different and almost-unrelated set of concepts, but also there are a significant number of people who seem unable to learn to spell correctly. For these reasons, a CAI system for teaching about effective writing must have several effective means for correcting misspellings in the student's answer before judging the correctness of the answer. Today's systems usually have spelling judgers that will count an input as correct if (a) it has a certain percentage of the correct answer's consonants, (b) it has a certain percentage of any of the letters of the correct answer in the correct sequence, or (c) it has the correct word except for a few letter inversions. Few

systems (with PLANIT (1, 3) being a notable exception) have routines for judging a word correct if, when pronounced, it would be phonetically equivalent to the criterion. Such a capability is, in my opinion, almost essential. (It should be noted however that the spelling judger for TUTOR IV, the authoring language for the PLATO IV CAI system, currently recognizes as misspellings over 60% of all actual misspellings and at the same time rejects as not-the-same 85% of non-synonymous contiguous word-pairs in a standard dictionary. The judger is extremely fast and may be powerful enough to obviate the need for phonetic judging.)

Some of the problems that a student would be asked to solve during a course in writing would almost have to allow a semi-free student response. Thus a CAI system for teaching such a course must be able to accept not just exact words or exact phrases or selected groups of words, it must also be able to accept answers in unexpected vocabulary that express the desired concept. How might a student's correct answer differ from one that the teacher-programmer would expect? It might (a) be more specific, (b) be more general, or (c) be synonymous. The only way that a computer could begin correctly to judge these three possibilities would be for it to parse each student input semantically (not syntatically--that's asking too much right now for a system that has to be time-efficient). Semantic parsing can be time-costly, but a minimal semantic parser need not be. It would work in the following way: each relevant (non-function) word of a student response would be replaced by a list of words from a special hierarchical thesaurus. If any element of the list for a given word matched any element of a similar list compiled from the specified answer, then the two words that generated those lists would be considered to match; each word of the input would be processed in the same way. The special dictionary would substitute, for each word in the answer, the next two levels of abstraction for which the given word was a subcategory. Thus if the expected answer was "house" the words "building" and "dwelling" would be substituted. If the

student answered "cottage" (whose supercategories would be "house" and "dwelling"), the system would find a match between "dwelling" and "dwelling" and would count the student's answer as correct. The judging of synonyms to the expected answer would be handled automatically since synonyms, by definition, would have the same supercategories as the expected answer. Of course, the example illustrates a problem: "house" can also mean "to contain" and another list would have to be compiled with this meaning in mind. The resulting lists might become quite long in some cases, especially if experience showed the need to expand the lists to another level of abstraction or specificity. Still, I believe that such semantic parsing can be economically feasible, and it would provide a needed flexibility of response. Such a routine would have to be modifiable by the individual teacher-programmer so that a word not in the thesaurus could be tied to a string of related words and entered in the thesaurus, and so that a teacher could limit the amount of "semantic distance" (8, 10) to be allowed between student answer and expected answer.

Paul Tenczar, a CERL senior staff member, to whom most of the credit for the above ideas belongs, has developed a question-answering system called DIALOG. It reduces all input words to their base synonyms (as defined by the lesson's author) and then addresses a data base to answer the question. In discourse on a limited topic such as diagnosis in veterinary medicine, it correctly answers 85-90% of freely-generated student questions.

The addition of a phonetic spelling judger and a conceptual comparator to the standard answer-accepting routines of today's CAI systems would provide sufficient power for computer-based instruction in the concepts discussed below.

AN ILLUSTRATED HIERARCHY OF TENTATIVE PRINCIPLES OF WRITING

The concepts below are organized hierarchically along lines

suggested by Gagné (4). Putting a conceptual tree into a columnar format is difficult, and while the result resembles an outline, it should not be read as one reads an outline. The most deeply indented concepts are the most basic, and are prerequisite for the less deeply indented ones. For each major heading one should begin reading with the most deeply indented concept and then read upward and to the left. The reader who is troubled by an occasional "a" without a "b" or a "1" without a "2" should remind himself that he is reading a tree, not an outline.

The tree covers eleven major concepts. The skeleton below indicates the topics covered, and the following sections treat some of the concepts in detail. A leafier tree can be obtained by writing to the author.

1. Audience
   - A. Identity
   - B. Uniqueness
   - C. Influence on writer
2. Purpose
   - A. Its necessity
   - B. Types
3. Strategy
   - A. Its necessity
   - B. Aspects
     1. Tone
     2. Arrangement
     3. Support
4. Thesis statements
5. Research
   - A. Function
   - B. Types
   - C. Library skills

6. Organization
   - A. Its complexity
     1. Spatial
     2. Temporal
     3. Order-of-importance
     4. Coordinate
7. Introductions
8. Transitions
   - A. Functions
   - B. Types
9. Conclusions
10. Paragraphs
11. Sentences
    - A. Dialect
    - B. Style
    - C. Vocabulary

I have no intention of claiming that the hierarchy presented here is either uniquely true or entirely good; limited experimentation with it has convinced me that portions of it will need revision. Also, it is clearly impossible to carry a hierarchy such as this to its most basic level: for each major concept the presumed entering repertory of behaviors is stated.

Many of the concepts are not stated in precise behavioral terms. This lack of precision was intentional. A too-precisely-stated concept is useful only to the person who wrote it or to some other person who wishes to copy the idea exactly. A more generally stated idea allows room for people's imaginations and pedagogical prejudices to work, and it provides enough flexibility that more than one mode or medium of instruction can be used to teach it.

THE STUDENT IS A COMPETENT ESSAYIST

Given some vague general notion about the sort of subject on which he might write:

1. He classifies his audience. That is,
   - A. He clearly identifies who his audience is.
   - B. He recognizes that different kinds of audiences (i.e. people) can best be reached through different kinds of approaches. In support of this understanding,
     1. He recognizes that he differentiates among audiences (siblings, parents, teachers, friends) all the time in his daily communication.
     2. He recognizes that professional writers almost always write with a specific audience in mind.
   - C. He can usefully speculate on the ways that audience variables may influence the writer's approach. To do so,
     1. He can identify audience variables such as age, sex, income, education, prejudices, occupation, prior knowledge, etc.

Entering repertory: The student is presumed to be functionally literate, and to be mature enough that, in Piaget's terms, he does not live in a primarily egocentric world.

Suggested activities: Depending (always) on the sophistication of the student, recognition of the need for considering one's audience can be built by: presenting segments of various stories written for different age levels or sexes, and asking the student to identify the sorts of people who would appreciate each; presenting a list of parent personalities and a list of arguments that might be used to attain some end and asking the student to specify which argument might work best with which parent and why; asking the student to decode a paragraph written in some outdated slang, telling him what

it means, asking him to use some of his own slang in a sentence and to identify the sorts of people to whom he would or would not speak that slang; presenting him with two imaginary employer-job seeker dialogs, one of which shows great discourtesy on the part of one of the parties, and asking him which dialog would be the more productive and why; presenting the student with a topic and a list of people who might be interested in it, and asking him to identify what features the members of the audience have in common, etc.

2. He identifies his purpose. That is,
   A. He recognizes that, in general, written expression is purposeful behavior, with a purpose beyond that of merely completing an assignment.
   B. He recognizes that there are several general purposes in writing, and can discriminate among
      1. Writing intended to persuade a reluctant audience of the validity of some idea or course of action,
      2. Writing intended simply to present information about a given subject,
      3. Writing intended primarily to entertain an audience.

Entering repertory: The student is presumed to be functionally literate.

Suggested activities: One at-the-terminal approach could be to present the student with sample dialogs of different kinds among the same two people. One such set might feature a mother telling her son what to do and a mother trying to convince her son that he ought to do something. Depending on the amount of stored information about the student, and the computer's own general store of information, away-from-the-terminal questions and/or assignments could be given; these would be concerned with the different purposes of television shows that the student watches or different movies that he has seen or books that he has read. Another approach would be to ask the student to distinguish among the functions served by various sections of a newspaper. Yet another might be to have him illustrate, after having seen the concepts, the different purposes that conversation serves, attempting to elicit distinctions among gossip (information) and planning things to do together (persuasion).

3. He identifies his strategy. That is,
   A. He has classified his audience (see the major heading).
   B. He has identified his purpose (see the major heading).
   C. He recognizes the importance, rhetorically, of defining a strategy.
   D. He recognizes, and can identify appropriate occasions for using various elements of strategy such as
      1. The employment of various dominant tones (e.g. arrogance, humility, knowledgeability, etc.). He can demonstrate that the dominant tone of a piece of writing establishes, in the reader's mind, his attitude toward both reader and subject. To do this he must be able to
         a. Define and differentiate among different tones, and especially
         b. Recognize irony
      2. Appropriate selection and ordering of arguments. He can exemplify the fact that this variable influences the overall forcefulness of his presentation.
      3. Quality of support for a given argument. He can exemplify the importance of this variable in establishing the credibility of an argument. To do so,
         a. He can employ and differentiate among different means of providing support such as
            1. Exemplification, where he
               a. Verbalizes that isolated or small-sample examples are not valid, but also
               b. Verbalizes the persuasive power of individual examples.
            2. Explanation, where he distinguishes between
               a. More-minute explanation for the audience that is knowledgeable but skeptical, and
               b. Simplified details for the uninitiated and uncomprehending audience.

3. Quotation, for which he can make selections on the basis of
   a. Authoritativeness of the person being quoted, and
   b. Audience appeal of the person being quoted.
4. Persuasive power of emotive appeals (not spelled out in this article).
5. The different strengths of different genres such as narrative, poetic, etc., which can be employed within the framework of an essay. (This element is not spelled out in this article).

Entering repertory: To grasp successfully the concept of strategy, a student probably needs a fairly skeptical view of the goodness and openness of the world around him. Inherent in the idea of strategy is the idea of consciously manipulating other people--and this concept is repugnant to many students. For them, lessons on strategy might well go unheeded and unlearned.

Suggested activities: "Strategy" is such a broad principal that the activities will be discussed separately for each major subheading.

Audience: activities are discussed above under a separate heading.

Purpose: Activities are discussed above under a separate heading.

Recognizing the importance of a strategy: It is assumed, in part, that the student is enough of a skeptic to see the need, in general, for strategic behavior. Nevertheless, students often see no connection, initially, between written expression and the real world. If lessons in audience analysis have been given previously,

some of this initial dissociation will probably have disappeared. One possible (and intriguing) approach would be to have the student simulate a salesman trying to solicit business via letter from some other firm. The various letters he would "write" would be paragraphs and/or individual sentences selected by him from a given set of possibilities. The computer, playing the other businessman, would compose a response based on the student's selection, would provide an analysis of the strengths and weaknesses of the student's approach, and would invite him to try again. A freer approach, with the student entirely responsible for generating a letter, would be too complex for the semantic parser.

Specific elements of strategy:

Tone: In the beginning the best approach might be to present the student with two or three essays on the same subject but written in markedly different tones. The best source of such materials is collections of satire and parody where strikingly different versions of well-known writings can be found. As the student becomes more competent, examples with smaller differences can be employed. Free student responses to such questions as "What is the tone of the first?" can be handled by a semantic parser; since a person is free to interpret such things as tone for himself, all that the computer must ascertain is that the student isn't making absurd interpretations; that is, the teacher-programmer would specify forbidden concepts rather than correct ones.

Selection and ordering of arguments: Clearly the same kinds of simulation suggested above would work effectively here. For each rearrangement of arguments that the student concocted the computer could respond with a critique.

Quality of support: Again, simulations could be used. These would be successful to the extent that the student felt the computer was behaving as a real person would.

4. He writes a thesis statement. In order to do so,
   A. He has sufficient knowledge of a topic to express an opinion concerning it.
      1. He can define and exemplify "topic."
      2. He can utilize research resources effectively. (See a subsequent major heading for more details.)
   B. He can correctly select possible thesis statements from a list of statements.
      1. He can define "thesis statement" (using his own words) as "an expression of opinion not open to direct sensory testing, the probable truth of which is to be demonstrated."

Entering repertory: Functional literacy.

Suggested activities: The idea that a piece of writing has a single central thesis toward the demonstration of which the whole paper contributes is not well known among most students. The best approach might be to present the idea in a straightforward fashion, illustrate it with a couple of examples, and then present further examples and ask the student to decide what their central purposes are. With sufficient time one could move toward an inductive definition of "thesis statement." Depending on his background, the student might have to be presented with explicit material about the differences between testable and untestable statements (often labeled inaccurately as 'fact' and 'opinion'). This material could be presented in the same way.

5. He utilizes research resources effectively. That is,
   A. He can verbalize, and defend, the discrete functions of research as including
      1. Research to find support for a given idea. This means that he already recognizes various means of providing support. (For a more complete description, see the section on strategy.)
      2. Research to increase one's basic knowledge of a subject.
   B. He verbalizes, and can defend, the idea that direct experimentation as well as informal communication with others are media of research in the same way that books in a library are.
   C. He successfully employs various library research skills.
      1. He takes appropriately complete content and bibliographic notes.
      2. He successfully employs bibliographies (general, in-book, in-article), indexes (periodical), and the card catalog to locate information relevant to a given topic
      3. He modifies his reading tactics appropriately for different kinds of materials and different purposes. (Details are not given in this article.)

Entering repertory: Aside from being functionally literate, the student should already possess enough knowledge of the library that he recognizes catalog cards and the Reader's Guide. He should already know enough about reading that he skims when skimming is appropriate.

Suggested activities: Instruction in note-taking is an easy job. If the computer presents a purpose and a thesis statement to the student, and then supplies him with sample pages from reference works with the instructions that he compose appropriate note cards, it can easily check those note cards for the presence of various kinds of expected information, and can inform the student of the consequences of having left out or included particular pieces of information. In

teaching the use of indices and bibliographies, the computer can present short lectures followed by research problems; the student is instructed to ask for indices and bibliographies (from his lecture notes) that he considers appropriate, and the computer can provide him with guidance as to the usefulness of the items he requests. Note that the semantic parser would not be needed for this activity since it would be wise for the student to learn the exact names of several basic research tools.

6. He chooses an appropriate mode of organization.
   A. He recognizes that complex presentations require complex modes of organization.
      1. He correctly employs a number of organizational modes.
         a. He employs spatial organization
            1. He recognizes unidirectional organizations such as horizontal, vertical, and radial, as possible ordering principles; and he can verbalize and defend the value of such principles.
            2. He can explain, defend, and illustrate the value "landmarks" as an aid to visualizing.
         b. He employs temporal organization
            1. He can illustrate that temporal organization influences the clarity of a narrative.
               a. He can discriminate between sequential and non-sequential organization.
         c. He employs order-of-importance organization.
            1. He can illustrate and explain means to combat the weakness of the middle position in a list of arguments.
               a. He arranges arguments for a given audience in rank order of strength and can justify his ordering.
         d. He employs coordinate organization.
            1. He recognizes a coordinately organized series of sentences, and he can identify their common superordinate.
               a. He discrimiantes, in a simple example of sentences about a single topic, those items which are superordinate, coordinate, and subordinate.

Entering repertory: Functional literacy.

Suggested activities: Clear organization is, perhaps, the single most important principle for a writer to learn--unless he is being purposefully obscure. It is also a fairly simple thing for the computer to teach. "Good" organization calls for the rearrangement of an already-collected body of ideas into some "best" order. A computer can present lectures, perhaps illustrated with samples for the student to judge, on various forms of organization, and can then present the student with collections of pre-written material which he is to rearrange and submit to the computer for judgement. To teach organization in this way rather than by having the student prepare original materials is probably to teach the principles more effectively: the important thing is not that the student learn the names of specific types of organization but rather that he learn to think about organizing every time he writes.

7. He employs an appropriate introduction. But before this
   A. He writes summaries, definitions, "motivators," and thesis statements. (All but the last are not spelled out in this article.)
   B. He recognizes the needs of different audiences. That is,
      1. He recognizes the importance of clear sentences. (See a subsequent major heading.)
      2. He correctly chooses whether or not to include more than a thesis statement in his introduction.
         a. He correctly identifies the introduction as (a) an attention getter, (b) a summary of content, (c) a term definer, and (d) a thesis stater.
         b. He correctly analyzes the complexity of his essay in terms of its intended audience.
            1. He realizes the necessity of defining new or ambiguous terms.
            2. He understands the "roadmap" function of summaries.
         c. He recognizes the value of brevity for some audiences.
         d. He recognizes the value of eliciting interest on the part of voluntary audiences.
      3. He is responsible in providing compact and efficient communication.
         a. He correctly identifies the conditions under which literal and efficient communication is appropriate. (n.b. almost always in an essay.)
            1. He distinguishes between reading for pleasure and reading for information.
            2. He states the idea that thought units beginning with the most important idea are the most conducive to easy classification.
      4. He recognizes the need for establishing an appropriate tone and point of view.
         a. He can define and differentiate different tones and points of view (see the major heading, "Strategy").

Entering repertory: Functional literacy, understanding of the nature and purpose of thesis statements.

Suggested activities: In most cases the best introduction is the shortest introduction. A student who learns too soon and too completely all the things that an introduction sometimes does will probably write poor ones.

8. He employs transitions appropriately. In order to do so
   A. He recognizes and can illustrate the importance of transitions as an aid to the reader.
   B. He can identify the appropriate environment for each transitional method.
      1. He verbalizes, and can defend, the idea that overuse of some transitions can bore the reader.
      2. He verbalizes, and can defend, the idea that some transitions are more "elegant" than others.
      3. He correctly employs each of a number of methods for effecting transitions.
         a. For a given mode of organization he can list at least five appropriate transitions. (See the major heading on organization.)
         b. He recognizes and employs relative pronouns and adjectives as backward referents.
         c. He identifies formal features such as paragraph indentions as transitional devices.
         d. He identifies rank-ordering devices such as letters and numbers as transitional devices.

FOR ALL OF THE ABOVE:

He identifies the function of transitions (i.e. to inform the reader that a new subdivision of thought has begun, and to indicate its relationship--spatial, sequential, coordinate, exemplary, alternative, etc.--with the preceding thought.

Entering repertory: The effective employment of transitions other than simple numbering and paragraph indention is a sophisticated kind of activity. Certainly the student must be functionally literate, but in addition he should know some of the principles of organization and audience analysis.

Suggested activities: The first step is to teach the student a working definition of "transition." This could be done by rote or by inductive examples. Practice at recognizing various kinds of transitions might be given by presenting examples of text, asking the student to identify transitions, and responding with appropriate comments. At a later stage it could give the student several short pieces of text to rearrange, adding transitions where necessary, and could check the logic and appropriateness of his additions.

9. He employs an appropriate conclusion.
   A. He has written thesis statements and summaries.
   B. He recognizes the thesis-restating function of the conclusion.
   C. He judges correctly the length and complexity of his essay in terms of its intended audience.
   D. He recognizes the summarizing function of conclusions for long essays.

Entering repertory: See the major heading on introductions.

10. He writes "good" paragraphs. That is.
   A. He correctly identifies his purpose in writing a paragraph.
   B. He recognizes and can explicate the functions of a paragraph.
      1. He employs the paragraph as the unit of dialog.
      2. He employs paragraphs as thought units.
         a. He employs the paragraph as a boredom breaker.
            1. He recognizes the possibility of dividing co-ordinate portions of a paragraph into separate paragraphs governed by a newly created introductory paragraph.
         b. He recognizes the need for having a single super-ordinate concern in a paragraph.

FOR ALL OF THE ABOVE:
He employs coordinate organization.

Entering repertory: In one sense a paragraph can be thought of as an essay in miniature. From my point of view it makes better sense to teach students about paragraphs after having taught them the general principles of organization that apply to the whole essay. This may be a good strategy if only because a student who learns first about paragraphs may become despondent at having still to learn how to combine them into an essay, while a student who thinks he has mastered the general form of the essay may be more interested in

polishing its internal structure.

Suggested activities: Most of the best activities are implied by the hierarchy itself. Giving a student unparagraphed examples of text and asking him to break the unit into paragraphs; giving the student too-minutely divided paragraphs and having him combine them; giving the student paragraphs with irrelevant material added, and asking him to delete the unnecessary.

11. He writes "good" sentences.
    A. He controls an appropriate spoken dialect.
    B. He discriminates between oral and written expression.
        1. He resolves pronominal ambiguities.
        2. He punctuates appropriately.

            FOR THE ABOVE:

                He recognizes the functions of pitch, stress, and juncture.

    C. He controls the variables of style.
        1. He can appropriately subordinate one idea to another.
            a. He can transform sentences into phrases or words.
            b. He can subordinate through the use of relative pronouns and adjectives.
        2. He has a good synonymic vocabulary and can use a thesaurus correctly.

Entering repertory: If a teacher's main concern in teaching effective writing is to first reform the student's sentences and then work on such areas as organization and content, that teacher will have a difficult job in front of him: it seems to make better sense to students that they should learn to manipulate sentences once they have seen, through writing clearly in most other respects, that they have something valuable to say. Learning to write "good" sentences should be one of the last things to be learned.

AFTERWORD

There is certainly no reason for anyone to take the foregoing material as anything more than a suggestion for one feasible approach. I have attempted to outline a teaching hierarchy, that would make sense both intuitively and pragmatically, for some of the principles of composition.

One final word of warning: I implied earlier that probably the only way to teach writing was to turn the students loose and let them write, later judging what they have achieved in light of what they said they wanted to achieve. I conceive of the hierarchy outlined here as a useful hierarchy for the planning of supplementary instruction - lessons to be taken by a student as he feels he needs them or to be assigned by an instructor on the basis of some specific deficiency that he sees in the student's writing.

BIBLIOGRAPHY

1. Atkinson, Richard and H. A. Wilson. Computer-Assisted Instruction, a book of readings. Academic Press, New York, 1969.

2. Cavanagh, Peter and Clive Jones. Yearbook of Instructional and Educational Technology 1969/70, incorporating Programmes in Print. Cornmarket Press, London, 1970.

3. Frye, Charles. "Planit in Orbit," Proceedings of a Conference on Computers in the Undergraduate Curricula. University of Iowa, September, 1970.

4. Gagne, Robert. The Conditions of Learning. Holt, Rinehart, and Winston, 1970.

5. Hamish, Dewar et al. "A Program for the Syntactic Analysis of English Sentences," Comm. ACM, v. 12, August, 1969, pp. 476-479.

6. Kuno, Susumu. "Multiple Path Syntactic Analyzer," Math. Ling. and Auto. Trans., number 9. Harvard University, Cambridge, Mass., January, 1963.

7. Lekan, Helen A. Index to Computer Assisted Instruction. University of Wisconsin, Milwaukee, 1970.

8. Quillian, M. Ross. "The Teachable Language Comprehender: a simulation program and theory of language,: Comm. ACM, v. 12, August, 1969, pp. 459-476.

9. Schwarcz, Robert, et al. "A Deductive Question Answerer for Natural Language Inference," Comm. ACM, v. 13, March, 1970, pp. 167-183.

10. Simmons, Robert. "Natural Language Question Answering Systems: 1969," Comm. ACM, v. 13, January, 1970, pp. 15-30.

11. Woods, William. "Context Sensitive Parsing," Comm. ACM, v. 13, July, 1970, pp. 437;445.